

## NOTES ON THE AVICULARIA. II

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An opportunity to observe the development of exerted achenes presented itself in the fall of 1941 when weather conditions were unusually favorable for their production. Cloudy and damp days with occasional rain were frequent in September, and during the first half of October there were eleven days without sunshine. No killing frost occurred until about October 20 so that growth continued up to that date. Four native species were observed and all agree essentially in the manner of production, but the readiness with which exerted achenes were produced and the extent of growth were quite different in each species. All species are of the fall-fruiting type, that is, flowers and fruits are very sparingly produced in spring and summer but a heavy crop of seed comes in fall. Of the four species studied, Polygonum exsertum Small most readily and abundantly produced exerted achenes. The plants grow near brackish water on saturated soil, crowded among tall grasses and weeds. The pond is near Mellette, South Dakota, and is fed by the overflow of artesian wells which supply the village. About the middle of September an abundant crop of fruit and flowers was present in various stages of development. Lowest on the inflorescence were many ripe achenes, quite normal and covered by the perianth, smooth, chestnut-brown, rather narrow, 1.1--1.4 mm. wide and 2.1--2.4 mm. long. Above these were slightly larger achenes, smooth, chestnut-brown, about 1.5 mm. wide and 2.5--3.0 mm. long, mostly covered by the perianth or sometimes slightly exerted. Above these again were some immature, olivaceous, exerted achenes, and finally some blossoms. The riper achenes were quite deciduous and easily fell away during handling and pressing. It was evident that exerted achenes do not develop from fully ripe or almost ripe fruit but grow from very young fruit or from blossoms while continuously under the influence of a moist atmosphere. Following a light frost or stormy weather the normal and intermediate forms fell away and the plants had only papery, olivaceous, exerted achenes. The proportion of normal to intermediate and dilated forms depends upon weather conditions between summer and fall. A prolonged dry summer delays flowering and if followed at once by a moist fall the intermediate and exerted forms will predominate. A summer gradually merging into fall causes early flowering, and normal achenes are produced abundantly.

Polygonum ramosissimum Michx. when growing somewhat re-

moved from standing water usually produces an abundant crop of normal achenes. These plants may then dry up and die. Other plants standing near water may survive to late fall when a crop of exserted achenes is produced. Specimens of these from which the leaves and normal achenes have fallen are usually classified as P. exsertum.

Polygonum prolificum and its related forms only tardily exhibit somewhat exserted achenes. Introduced species, if and when they survive to October, usually show modified achenes which are exserted with a pointed apex. In October P. aviculare has elongated achenes with smooth, unstriated faces which become rounded and partly or entirely lose the triangular shape. The adjective "dimorphic" has been applied to these variously shaped achenes.

Polygonum commixtum Greene. With the species so far mentioned above the entire plant is involved, as well as the entire population in an area. Dr. Greene set up the species P. commixtum with the exserted and deformed achenes as the chief character. Careful examination of many specimens discloses that often the whole plant is not involved, but only a twig, a branch, or some larger part which has become thickened and condensed and on which the misshapen achenes are formed. The normal parts of the plant have the usual normal achenes. It may be noticed that the parts involved may have been injured, as by trampling. Dr. Greene's species is evidently P. Austinae with exserted and deformed achenes of this character. In various herbaria specimens with this deformity have been observed in the following species: P. Austinae, P. Douglasii, P. Engelmannii, P. sawatchense, and P. montanum.

The fully developed exserted achene presents an enlarged embryo loosely surrounded by a paper-thin, olivaceous pericarp which contains more or less air or gas. The tendency to produce exserted achenes is common in the Avicularia but is not present in the related Persicaria. That this unique character should serve some useful purpose seems almost certain. The Avicularia do not grow on submerged land nor do they long survive accidental inundation, although they are abundant on newly emerged and marginal lands. Contrarily, the Persicaria do survive inundation, and some species thrive best in shallow water. On our semi-arid glaciated prairie are many shallow lake-beds, round or elongated in shape, interrupted water channels which act as catch-basins. Some of them dry up regularly during the summer, but others may retain water for years. Our native species of Avicularia are abundant along the shorelines of these basins. They are among the pioneers which first occupy the bottoms of newly dried sloughs and lakes. The uncertain waterlevel during changes from dry to wet cycles, or the reverse, often leaves

these bottoms with bare ground where neither a meadow nor a slough flora can become established. A sudden filling of such a basin will drown standing vegetation and survival may well depend upon buoyant seed floated to a higher shoreline. We have here a logical reason for the development and usefulness of the exserted achene. Other facts corroborate this theory. The time of their production, at the beginning of a wet season, coincides with the most likely time for floods. Examination of the distribution of colonies is often very suggestive of waterlevel, windrow deposits. Tufted stems of old dead colonies may be entirely ignored as likely location points for the present year's colonies, the new being located higher or lower on these shorelines.

The Avicularia have become obligatory land inhabitants and have extended their range to higher and drier locations. That the trend has been away from water rather than toward it is demonstrated by the acquisition of protective characters in xerophytic situations which are readily discarded when the plants again occupy wet locations. One such character is the accrescent perianth which grows with the achene and fully envelopes it when mature. During dry weather this perianth exceeds and clasps the achene, becomes veined and wrinkled, and is more or less carinate. When wet conditions prevail with production of exserted achenes the perianth remains shorter and the sections are spreading and smooth. Reticulations, striations, and other markings on the achenes are probably due to shrinkage of the surface to reduce evaporation. Species of Avicularia on the coastal areas of the Maritime Provinces normally have large smooth exserted achenes surrounded by a spreading perianth. The atmosphere moist from fog, spray, and marshland provides proper conditions for this type of achene.

SUMMARY:- The exserted achene serves usefully in the dispersion of seed during periods of inundation and aids in its survival. It is produced only by species of Avicularia under certain seasonal and weather conditions. Exserted achenes have little or no diagnostic value in differentiating species.

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ADDITIONAL NOTES ON THE GENUS PETREA. I

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Since the publication of my monograph of this group in Fedde's Repertorium Specierum Novarum 43: 1--48 & 161--221 (1938) two hundred and seventy additional specimens have